November 2001

Taiwan

Located across the Taiwan Strait from mainland China (80 miles at the closest point), Taiwan is a leading economic and trading center, with one of the busiest ports in the world (Kaohsiung). As Taiwan lacks sufficient domestic energy sources, it is almost totally dependent on energy imports. Taiwan has experienced rapid growth in energy consumption in recent years due to high levels of economic growth, though in the short term the country's recession is likely to interrupt this trend.

Note: The information contained in this report is the best available as of November 2001 and can change.

GENERAL BACKGROUND

Compared to other Asian countries, Taiwan weathered the financial crisis of 1997-1998 well, and growth in real gross domestic product (GDP) receovered to 5.3% for 1999 and 6.0% for 2000. The global economic downturn of 2001, however, has hit Taiwan hard and pushed its economy into a recession. The country's economy is heavily oriented toward manufacturing of consumer electronics and computer products for export, and demand for these items has fallen. Taiwan's real GDP is projected to shrink by 1.9% for 2001 as a whole, recovering to slow growth of 1.6% in 2002.

Oil is the dominant fuel in Taiwan's energy mix, accounting for 49% of total primary energy consumption. Coal also plays an important role (32% of total energy consumption), followed by nuclear power (11%), natural gas (6%), and hydroelectric power (3%). Taiwan has very limited domestic energy resources and relies on imports for most of its energy requirements. The country's industrial sector accounts for more than half of total energy demand, but this share is expected to decline slightly, since Taiwan's economy is moving toward newer, less energy-intensive industries. The transportation sector

accounts for one-quarter of total energy demand.

Taiwan was admitted to membership in the World Trade Organization (WTO) in November 2001, concurrently with China's admission. Unlike China, Taiwan has been admitted to the WTO as a "developed country," which imposes more stringent requirements for reducing barriers to foreign competition. Taiwan recently has lifted some restrictions on direct trade with and investment in mainland China, which is expected to increase cross-strait commercial ties.

OIL

Chinese Petroleum Corporation (CPC), Taiwan's national oil company, is the dominant player in all sectors of the country's petroleum industry, including exploration, refining, storage, transportation, and marketing. However, significant competition began in July 2000 with the opening of a refinery at Mailiao owned by Formosa Petrochemical Group (FPG), a subsidiary of the private Taiwanese petrochemical firm Formosa Plastics. The first phase of production from FPC's Mailiao refinery began in mid-2000 at 150,000 barrels per day (bbl/d). The second and third phases are under construction, but operation has been delayed beyond the planned early 2001 startup dates. The full capacity of 450,000 bbl/d is still expected to become operational in 2002.

Prior to the construction of the FPC Malilao refinery, Taiwan imported a significant quantity of refined petroleum products. Now the country's refining capacity exceeds its domestic consumption of petroleum products, making it an exporter. The global and Asian economic slowdowns, however, have reduced demand, which has had a negative impact on Taiwanese refiners. The FPC Mailiao refinery has had to cut its production runs sharply in recent months due to declining margins.

Taiwan's current crude oil production is under 1,000 bbl/d. Most of Taiwan's crude oil imports come from the Persian Gulf, though West African countries also are important suppliers for Taiwan. To ensure against a supply disruption, Taiwan's refiners are under a regulatory requirement to maintain stocks of no less than 60 days of consumption. Refiner-held strategic petroleum stocks are the norm in Asia, and Taiwan's policy is similar to those of Japan and South Korea.

Taiwan's government has announced plans to further liberalize the petroleum sector. Taiwan's legislature passed the Petroleum Administration Act in September 2001, which removed CPC's quasi-governmental policy implementation functions, and which will permit the eventual sale of a majority stake in the firm, which is to take place by mid-2004. Foreign firms will be allowed to acquire stakes in CPC on an equal basis with domestic investors.

Despite the lack of formal ties between Taipei and Beijing, Taiwan and mainland China have developed a cooperative relationship in the field of energy. CPC and Beijing's state-owned China National Offshore Oil Corporation (CNOOC) signed a deal in 1996 to jointly explore a 5,939-square-mile area in the Tainan Basin of the Taiwan Strait. Taipei officially ratified the deal in March 1998, and the first round of seismic surveys by the two companies was completed in October 1999. The companies' geologists have reportedly identified several structures considered worthy of exploration, and the two firms have expressed interest in forming a joint venture company to carry out exploratory drilling in the area.

NATURAL GAS

Besides oil, CPC also is responsible for Taiwan's natural gas exploration, production and imports. Taiwan imported 203 billion cubic feet (Bcf) of liquefied natural gas (LNG) in 1999. Indonesia and Malaysia are Taiwan's two LNG suppliers, with Indonesia accounting for 114 Bcf and Malaysia accouting for 89 Bcf. A modest amount of natural gas is produced domestically, and total natural gas consumption in 1999 was 220 Bcf.

CPC operates Taiwan's only LNG receiving terminal -- at Yungan, Kaohsiung. The terminal's current capacity is 220 Bcf per year. CPC anticipates an increase in natural gas demand due to the construction of additional power plants. The government plans to triple LNG consumption by 2010 for environmental

reasons, as natural gas is the cleanest burning fossil fuel.

Meanwhile, Taiwan's energy sector market liberalization program has made possible the construction of competing LNG import terminals. Several private Taiwanese and Japanese firms have formed a consortium, Tung Ting Gas, to pursue an LNG regasification project in Tao-Yuan county. Construction of the terminal was started in mid-2001 by Japan's Chiyoda and Taiwan's CTCI, and is scheduled for completion in 2004. A preliminary agreement has been signed with Qatar's RasGas for LNG supplies.

COAL

In Taiwan, coal is used for electric power generation as well as for the steel, cement and petrochemical industries. Taiwan produces small quantities of coal, but the bulk of its 44.9 million short ton (Mmst) demand is met with imports, with Australia and China major suppliers.

ELECTRIC POWER

Taiwan Power Company (Taipower), the state-owned electric power utility, currently dominates Taiwan's electric power sector. However, Taipower's monopoly status has been undermined by a 1994 measure which allowed independent power producers (IPP's) to provide up to 20% of Taiwan's electricity.

Independent power producers are required to sign power purchase agreements with Taipower, which distributes the power to consumers. However, new regulations issued by the government in July 1998 allow foreign investors to play a greater role in Taiwan's electric transmission and distribution sector. The new rules raised the level permitted of foreign investment in these sectors to 50%, from 30% previously.

Taiwan's first major IPP, the coal-fired Mailiao plant owned by Formosa Plastics, began operation in 1999. It currently has a capacity of 2,400 megawatts (MW) in four 600-MW generating units, and sells about three-quarters of its output to Taipower. A second, coal-fired IPP plant, Ho-Ping Power, is to begin commercial operation of its first 660-MW unit in March 2002, with a second unit beginning operation in July 2002. Ho-Ping is a joint venture including Taiwan Cement Corporation and Hong Kong's China Power and Light Corporation. Several other IPP projects have been approved, though the current economic slowdown may delay some of these projects.

At the end of 2000, Taipower operated 70 power plants with a total installed capacity of 29,634 MW, of which 68% was thermal and 17% nuclear, according to Taipower's published figures. Taipower retains exclusive control over nuclear and hydropower plants. The government will continue to own these assets after Taipower is privatized. Taipower currently has 5,144 MW of nuclear generating capacity at 3 plants (Kuosheng and Chinshan stations in the north and Maanshan station in the south).

Taipower also has plans for a 4,000-MW LNG-fired complex, the Tatan Power Plant. The facility is scheduled to begin operation in late 2003, but this date may slip due to demand or lack of LNG supplies. The tender for LNG supplies to the plant has been cancelled twice in 2001, first due to a lack of the three competing bids required under Taiwanese law for public-sector procurements, and then in November 2001 due to uncertainty about future demand for electric power.

One major controversy which has affected Taiwan's electric power over the past two years concerns the future role of nuclear power. Taiwan's new Democratic Progressive Party government came into office promising to approve only LNG-fired power projects in the future, and to increase LNG's share of Taiwan's power generation to roughly one-third by 2010. This raised the question of what to do about the 2,700-MW Kungliao nuclear power plant, which is currently under construction. The new government attempted to terminate the project in October 2000, but action by the legislature and courts forced a resumption of construction in February 2001.

A new electricity law has been under consideration in Taiwan's parliament, the major feature of which is expected to be the privatization of Taipower. Progress, though, has been slow, and the legislation is being reworked by the new Democratic Progressive Party government which came into office in May 2000.

Under the basic framework envisioned, Taipower would retain a monopoly on transmission and distribution networks, but Taipower's generation assets would be split into several firms. The planned privatization is to an extent the result of rapidly rising power demand in Taiwan, and Taipower's inability to build sufficient capacity to keep pace with demand, which led to a power crisis during the summer peak-demand months in 1999. The expected date for completion of Taipower's privatization was originally 2001, but several issues, most notably the controversy over nuclear power, have pushed the expected date back to 2005. If construction were halted, it would pose major financial problems for Taipower, which has already invested more than $2 billion in the project. Rate increases might be necessary, and a financially-weakened Taipower would be much more difficult to privatize.

ENVIRONMENT

Taiwan currently is grappling with the environmental ramifications of building one of Asia's richest economies through a decades-long commitment to economic growth. Environmental issues include: the pollution of air and water in urban areas, stores of nuclear and toxic wastes, loss of fisheries and coastal ecosystems, and an overall degradation of the country's natural landscape.

Per capita energy use in Taiwan is on par with several of its neighboring countries in Asia. However, energy intensity levels in Taiwan compared to other developed countries tend to be relatively high. This is due primarily to the country's heavy concentration of energy-intensive manufacturing industries.

Taiwan's per capita carbon emissions have more than doubled since 1980, and in 1999 represented more than five times the amount of per capita carbon emissions in China (0.53 metric tons). Compared to Taiwan's neighbors, carbon intensity (the amount of carbon consumed per dollar of GDP) in Taiwan has experienced very little growth since 1980.

Air pollution in Taiwan is most obvious in Taipei -- the country's capital and largest city. The primary cause of urban air pollution in Taipei is the large number of motorbikes and scooters which are the main source of transportation for millions of the city's residents. There are approximately 15 million motorbikes in Taiwan, and the number is expected to continue growing at a rate of 1 million a year. Nuclear power plays an important role in Taiwan's energy sector, making up 17% of Taipower's electric generation.

Sources for this report include: Asian Wall Street Journal; CIA World Factbook 2001; Dow Jones News Wire service; Economist Intelligence Unit ViewsWire; Oil & Gas Journal; Petroleum Intelligence Weekly; Platt's Oilgram News; Reuters News Wire; U.S. Energy Information Administration; U.S. Department of State; WEFA Asia Economic Outlook.

COUNTRY OVERVIEW

President: Chen Shui-bian (since May 2000)
Population (7/01E): 22.4 million, heavily concentrated along the west coast
Area: 14,000 square miles (slightly larger than Maryland and Delaware combined)
Major Cities: Taipei (Capital), Kaohsiung, Taichung, Tainan
Major Religions: Mixture of Buddhist, Confucian, and Taoist 93%, Christian 4.5%, other 2.5%
Languages: Mandarin (official), Taiwanese (Min), Hakka Chinese dialects
Ethnic Groups: Taiwanese, 84%; mainland Chinese, 14%; aborigine, 2%
Armed Forces (8/98): Army, 240,000; Air Force, 68,000; Navy, 68,000

ECONOMIC OVERVIEW

Currency: New Taiwan Dollar (NT$)
Exchange Rate (11/12/01): US$1 = NT$34.5
Gross Domestic Product (2001E): $302 billion
Real GDP Growth Rate (2001E): -1.9% **(2002F):** 1.6%
Inflation Rate (consumer prices, 2001E):1.2% **(2002F):** 0.8%

Unemployment Rate (2001E): 4.9%
Total Reserves, Non-Gold (2001E): $77.5 billion
Current Account Balance (2001E): $9.9 billion
Merchandise Exports (2001E): $151.4 billion
Merchandise Imports (2001E): $136.6 billion
Merchandise Trade Surplus (2001E): $14.8 billion
Major Exports: Textile products, electrical machinery & apparatus, machinery, chemicals & allied products, iron & steel, plastic articles
Major Imports: Crude oil, capital goods, consumer goods, agricultural and industrial raw materials
Major Trading Partners: United States, Japan, Europe, Hong Kong (China)

ENERGY OVERVIEW

Minister of Economic Affairs: Lin Hsin-i
Proven Oil Reserves (1/1/01): 4 million barrels
Oil Production (2000E): 3,300 barrels per day (bbl/d), of which 800 bbl/d is crude oil
Oil Consumption (2000E): 782,000 bbl/d
Net Oil Imports (2000E): 778,700 bbl/d
Crude Oil Refining Capacity (1/1/01): 920,000 bbl/d
Natural Gas Reserves (1/1/01): 2.7 trillion cubic feet (Tcf)
Natural Gas Production (1999E): 31 Billion cubic feet (Bcf)
Natural Gas Consumption (1999E): 220 Bcf
Liquefied Natural Gas (LNG) Imports (1999E): 203 Bcf
Coal Reserves (12/31/96): 1.1 million short tons (Mmst)
Coal Production (1999E): 0.1 Mmst
Coal Consumption (1999E): 44.9 Mmst
Net Coal Imports (1999E): 44.8 Mmst
Electric Generating Capacity (1/1/99E): 26 gigawatts
Electricity Generation (1999E): 140 billion kilowatthours

ENVIRONMENTAL OVERVIEW

Total Energy Consumption (1999E): 3.5 quadrillion Btu* (0.9% of world total energy consumption)
Energy-Related Carbon Emissions (1999E): 63.0 million metric tons of carbon (1.0% of world total carbon emissions)
Per Capita Energy Consumption (1999E): 159.3 million Btu (vs. U.S. value of 355.8 million Btu)**
Per Capita Carbon Emissions (1999E): 2.8 metric tons of carbon (vs. U.S. value of 5.5 metric tons of carbon)
Energy Intensity (1999E): 12,799 Btu/$1990 (vs U.S. value of 12,638 Btu/$1990)**
Carbon Intensity (1999E): 0.23 metric tons of carbon/thousand $1990 (vs U.S. value of 0.19 metric tons/thousand $1990)**
Sectoral Share of Energy Consumption (1998E): Industrial (56.8%), Transportation (23.7%), Residential (12.1%), Commercial (7.4%)
Sectoral Share of Carbon Emissions (1998E): Industrial (60.4%), Transportation (22.2%), Residential (10.8%), Commercial (6.5%)
Fuel Share of Energy Consumption (1999E): Oil (49.2%), Coal (31.6%), Natural Gas (6.3%)
Fuel Share of Carbon Emissions (1999E): Oil (51.2%), Coal (43.7%), Natural Gas (5.0%)
Renewable Energy Consumption (1998E): 110 trillion Btu* (10% increase from 1997)
Major Environmental Issues: Air pollution; water pollution from industrial emissions, raw sewage; contamination of drinking water supplies; trade in endangered species; low-level radioactive waste disposal.
Major International Environmental Agreements: Taiwan is not a party to any of the selected agreements.

* The total energy consumption statistic includes petroleum, dry natural gas, coal, net hydro, nuclear, geothermal, solar and wind electric power. The renewable energy consumption statistic is based on International Energy Agency (IEA) data and includes hydropower, solar, wind, tide, geothermal, solid

biomass and animal products, biomass gas and liquids, industrial and municipal wastes. Sectoral shares of energy consumption and carbon emissions are also based on IEA data.

**GDP based on EIA International Energy Annual 1999

ENERGY INDUSTRY
State Energy Companies: Chinese Petroleum Company (CPC), Taiwan Power (Taipower)
Oil Refineries (1/1/01 capacity): Kaohsiung (270,000 bbl/d), Ta-Lin (300,000 bbl/d), Taoyuan (200,000 bbl/d); Malilao (150,000 bbl/d)
Major Ports: Kaohsiung, Keelong, Hwalien, Taichung, Suao
LNG Terminal: Yungan (220 Bcf annual capacity)

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